COURSE REGISTRATION FORM

Teacher	Gordana Racić
University	EDUCONS University
Course	Bioremediation in agriculture
Target	Agricultural Middle Schools
Type	classic
Duration	2 days - 16 hours

Description	The main objective of the course is teachers' education on the application of environmentally friendly methods in agriculture. The course will consist of a review of the basic methods for remediation and revitalization of soil, with a focus on the use of microorganisms to detoxify soil in order to prepare for agricultural production. The agricultural farmlands are exposed to dangerous xenobiotics through distinct pollution from the environment. From these compounds the most outstanding problems are related to the following two groups of pollutants: POP (Persistent Organic Pollutants) and PAHs (Polycyclic Aromatic Hydrocarbons), such as heavy metals which are recognized as being directly toxic to biota. Even if present in small concentrations they are dangerous as all have the quality of being progressively accumulated higher up the food chain. Their relative toxic/carcinogenic potencies are compound specific. Therefore a continuously detoxifying technology for soil is needed in the course of agricultural production. Examples from practice and personal experience of the lecturers will contribute to a better understanding for applying the method of bioremediation, with additional emphasis on the sustainability and economic viability of this method.

Contents	1. Remediation and revitalization of soil 2. Bioremediation 3. Ecology of microorganisms 4. Bioremediation in conventional and organic agriculture 5. Organic and inorganic pollutants in agriculture 6. Soil monitoring in agriculture 7. Application of microbiological and molecular methods in agriculture 8. Practical work in the laboratory (PCR-polymerase chain reaction) 9. Sustainable development and bioremediation in agriculture 10. The economic benefits of the application of bioremediation in agriculture

Objectives	The aim of the course is to determine the current knowledge of teachers in the field of the application of environmentally friendly methods in agriculture. The course should provide understanding of the basic role and importance of

	microorganisms in natural and agroecosystems, interactions between plants and microorganisms, microbial adaptations to different environmental conditions and use of bioremediation as a novel technology. Also, during the course teachers will have the possibility of mastering basic laboratory techniques used in biotechnology.
Activities	The course will begin with a test in order to determine the level of knowledge and experience of the participants in the application of bioremediation technologies in agriculture. Based on the results of the test duration of specified activities will be determined in order to be successful in achieving goals of the course. The first day of the course, envisages introduction of the participants to the basic concepts in microbiology, organic and conventional agriculture and bioremediation of soil. At the end of the each unity, the lecturer will refer to the discussions, where he will show to the teachers the advantages and disadvantages of the application of bioremediation methods both in biotech and economic terms through good practice examples. At the end of the day participants will be awarded the material on the advantages and disadvantages of the application of bioremediation, which they will be supposed to read and prepare for the next day. The second day of the course, the lecturer will start with organizing a debate, where participants will be divided into two groups, one of which will have to prepare a presentation on the advantages and other on disadvantages of bioremediation. During the debate, speakers will show teachers scientifically and practically confirmed facts about exposed presentations. After introducing with various methods of application of the method of bioremediation in agriculture course participants will be divided in groups and according to the materials provided jointly analyze the presented conclusions from the debate organized on the advantages and disadvantages of this method. This exercise involves the division of the group, work in groups, presentation of groups and conclusions. After this exercise, the participants of the course will be conducted to the laboratories tour, where they will be presented methods used in classical and molecular methods of analysis of microorganisms. Participants in groups will determine the importance and effects of application of certain methods, and then based on their findings and observations appropriate methods for the determination of the indigenous strains of microorganisms in soil will be applied. At the end of the course lecturer will present the results of laboratory analysis of the participants. The course ends by performing the most relevant new information on the potential application of bioremediation methods in agriculture by the participants of the course (group discussion).

Materials	Classroom, projector, whiteboard and markers, laboratory, laboratory supplies and chemicals necessary for the experiment (the standard method of cultivation of microorganisms, metagenomics), scientific works in the field of bioremediation.